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Rural Water Supplies in South Dakota : Ziebach County

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ZIEBACH
County

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RURAL WATER SUPPLIES

IN

SOUTH DAKOTA

ZIEBACH COUNTY

BY

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AND

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PREPARED BY THE WORK PROJECTS ADMINISTRATION AS A REPORT ON THE WELL SURVEY CONDUCTED AS WORK PROJECTS ADMINISTRATION OFFICIAL PROJECT 665-74-3-126; SPONSORED BY THE EXTENSION SERVICE AND THE EXPERIMENT STATION SOUTH DAKOTA STATE COLLEGE, IN COOPERATION WITH THE STATE GEOLOGICAL SURVEY.

JANUARY . 1940

FOREWORD

This study was first proposed as a project of the Mineral Resources Committee of the State Planning Board under the direction of the State Geological survey and undertaken as a Work Projects Administration project sponsored by the State Planning Board, and was continued under the Planning Board until that body was abolished July 1, 1939 by the State Legislature. At that time sponsorship was transferred to the South Dakota Agricultural Experiment Station and the State College Extension Service, South Dakota State College. Field work was begun October 1, 1938 and was practically completed by February 15, 1939. Workers were assigned in the several counties under the supervision and direction of the County Agricultural Agents and Field Supervisors who were employed by the Work Projects Administration. Questionnaires were mailed out from the offices of the County Agents and were checked and tabulated in these offices. The material was then forwarded to the central office for final tabulation and analysis under the direction of Elmer E. Meleen and Walter V. Searight.

Particular credit should be given to the individual County Agricultural Agents in the various counties of the state who arranged the contacts with the individuals from whom these data were collected, furnished a large portion of the necessary supplies for field work, and directed the workers engaged in collecting field data. Without this assistance in gathering basic data, this study could not have been conducted. The value of the report is therefore in direct proportion to the accuracy and adequacy of these basic data.

INTRODUCTION

PURPOSE

This report on rural water supplies of South Dakota has been prepared to present data recently made available on the types and the sources of water supply, exclusive of stream, lake and dam waters. The information presented is of importance to evaluate present supplies. It should also prove useful as a basis for further development of supplies where they are needed or become necessary. Further, it is hoped that the facts presented may prove of value in any program of water conservation.

SOURCES OF INFORMATION

Questionnaires were sent to all, or essentially all of the farmers of the state, asking for complete data on farm wells and supplementary supplies, with the exception of the supplies above noted. A most gratifying number returned questionnaires, actually 60.1% average for the entire state. The coverage is probably more than 60.1% since it is likely that many unanswered inquiries were those to farmers who were without wells, the type of supply emphasized in the questionnaires. The data thus obtained were supplemented with information contained in the files of the State Geological Survey, the office of the State Engineer, and reports of the United States Geological Survey. This supplementary information, together with that contained in questionnaires was used in making the well location maps included in this report.

PROCEDURE

All data from the questionnaires were tabulated and analyzed statistically by counties, which were made the areal units of study. Within the county,

Acknowledgments - The authors wish especially to acknowledge and commend the conscientious assistance of Mr. E. L. Woodburn, Supervisor, for careful and painstaking supervision of statistical work. The authors also desire to express appreciation for the constant interest and support of this project by Mr. Bob Butts, Director of Research and Records Projects, South Dakota Work Projects Administration.

supplies were allocated as to kind on county maps. Since shallow waters are the most important source of rural supply in South Dakota, wells 200 feet deep and less were plotted on county maps from which maps indicating depths of wells by 50 foot intervals were made. Springs, shown on the well location map, and cisterns were also tabulated as important supplementary supplies, although the latter do not appear on maps or in the tables in this report.

PRESENTATION OF DATA

For convenience and utility, this report has been divided into sections, each covering one county, and each county section bound separately. Each county report contains the following material wherever possible.

1. Well Location Map: This map shows the location of all wells and springs within the county, so far as information is now available. These have been plotted in such a manner that artesian and shallow wells can be differentiated readily by the reader. Artesian wells, where they occur, are divided into flowing and pumped. Artesian wells showing decreased flow and those reported as controlled are also indicated by symbols. Shallow wells are differentiated as adequate and inadequate, and dry holes as of 1938 are located. Wells from other sources of information other than questionnaires collected, by this survey are shown in blue.

2. Shallow Well Map: This map shows, as accurately as possible, in 50 foot intervals, the depths at which shallow supplies are commonly obtained. Where shallow wells are abundant, as indicated by the well location map, the map is as accurate as the information on which it is based, but where such wells are sparsely distributed errors are likely to occur. In many places reports of shallow wells are absent, in which case the area has been left blank.

3. Table of Pumped Wells, from 0 to 200 feet (inclusive) in depth: This table shows minimum, maximum, and average depths of wells within the county, as reported in the questionnaires. Tabulations are by townships. The general character of the water, hard, medium, and soft, as reported by farm-

ers, and the number of wells suitable or unsuitable for drinking are shown in this table. Further, the adequacy of supply, as indicated on the questionnaires, and the use for irrigation are shown here.

4. Table of Wells greater in depth than 200 feet: Minimum, maximum, and average depths are indicated. Character, reported as hard, medium or soft is tabulated. Adequacy and use for irrigation are shown as in the preceding table.

5. Table of flowing wells: Minimum, maximum, and average depths are shown together with general character and use for irrigation. The volume of flow as reported, and the number of flowing wells reported as equipped with control valves is also included in this table.

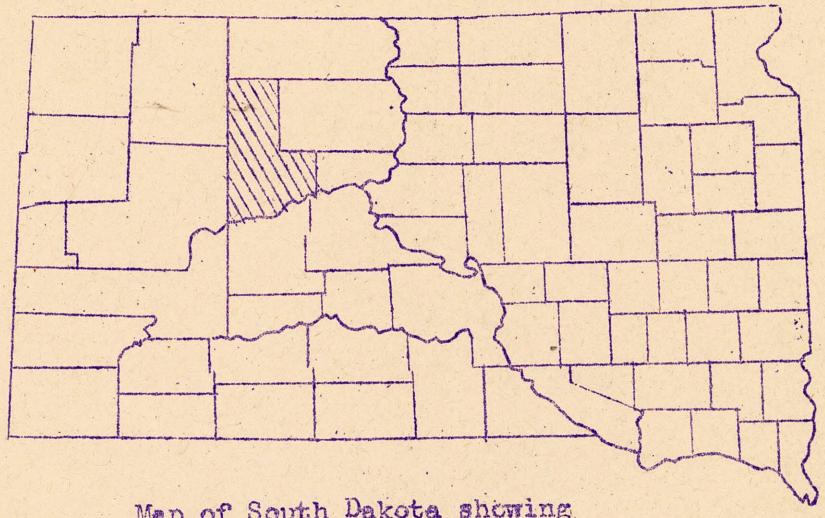
SUMMARY OF STATE SUPPLIES

In the entire state, a total of 48,479 wells were reported in response to questionnaires, returned by 60.1% of the recipients. If those who did not respond have a number of wells in proportion to those who reported, there are approximately 80,000 wells in South Dakota. There are possibly many less than this number since several counties with large numbers of wells returned over 75% of the questionnaires and since many farmers without wells did not reply because they were not requested to do so in the formal questionnaire. Of the wells reported, 16.2% are artesian, including both pumped and flowing wells. Shallow wells are 83.8% of the wells reported. Wells from shallow sources are thus obviously by far the most important means for obtaining water in rural South Dakota.

Important supplementary supplies are cisterns and springs. Roughly, there is more than one cistern to each 40 wells. Many springs are reported, however, in counties with very few wells, so that in some localities they are of considerable importance.

ZIEBACH COUNTY

Ziebach county lies in northwestern South Dakota and is bounded on the north by Corson county, on the east by Dewey and Armstrong counties, on the south by the Cheyenne river, and on the west by Meade and Perkins counties.



Map of South Dakota showing location of Ziebach county

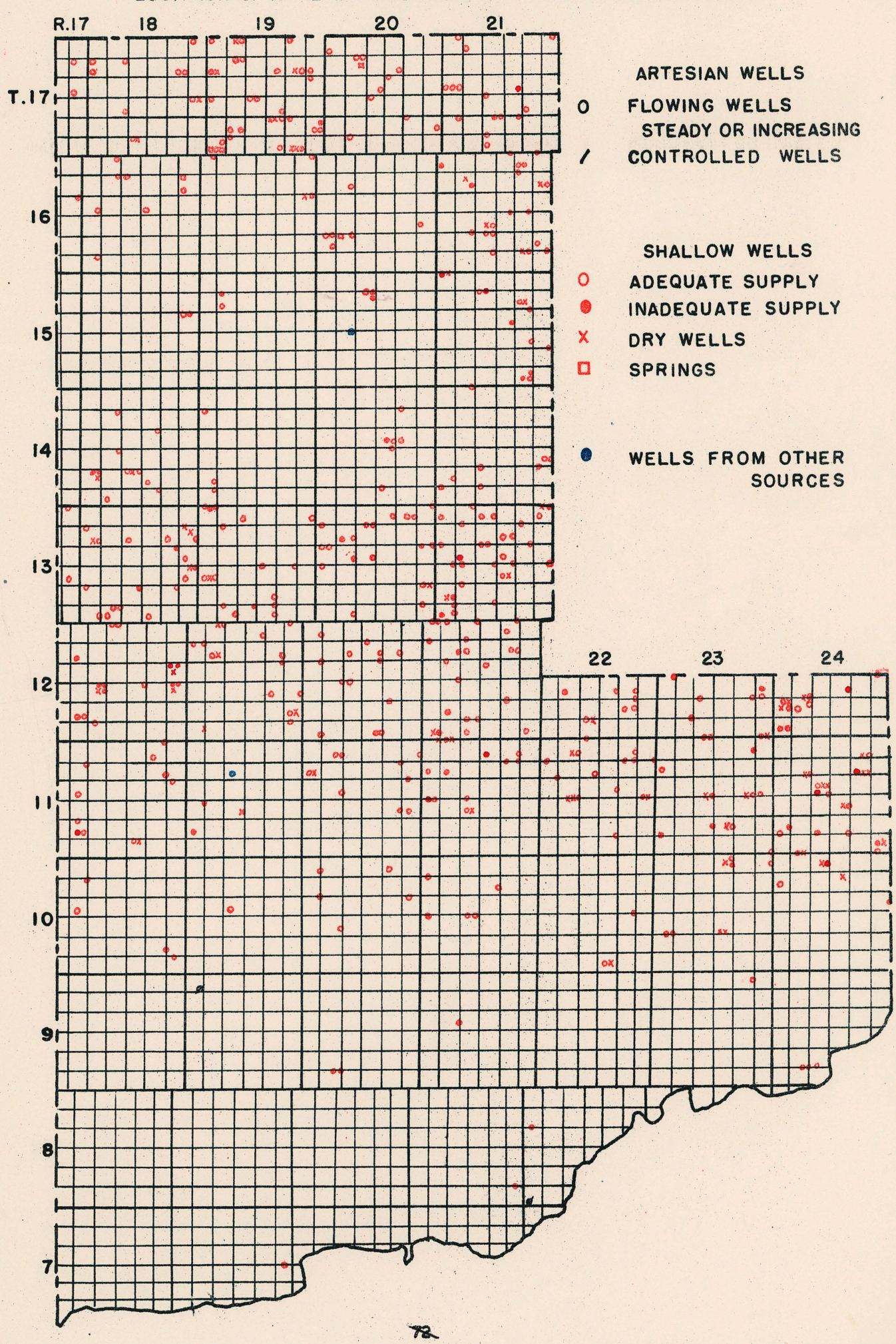
Ziebach county is an agricultural county with essentially all of the 1,263,360 acres in farms divided into 733 farm units. Only about 16.5 per cent of the acreage in farms is under cultivation, however. Wheat, hay, corn, oats, barley, sorghum forage, rye, and flax are the important field crops, being produced in the order named. Livestock is important; cattle, sheep, horses and mules, and hogs valued highest. Poultry is also important in the county.*

In order that farms of this type may be operated successfully, it is necessary that suitable and adequate supplies of well water be available and that it be obtained at low cost. The shallow well map on page 9 indicates that some water is obtained at shallow depths from most parts of the county. In some areas serious difficulties were encountered as will be noted from the quotations which were taken from the questionnaires and are listed at the end of this report. The well location map of Ziebach county indicates, however, that supplies are available in many localities.

On the well location map of Ziebach county, flowing wells and deep pumped wells obtaining water under pressure, are shown in black as artesian wells.

*South Dakota Agricultural Statistics, Annual Report, 1937.

LOCATION OF ARTESIAN AND SHALLOW WELLS IN ZIEBACH COUNTY



All other wells are shown in red and are called shallow wells regardless of depth. On all other maps and in the tables and in the text of this report, the term shallow wells applies to those wells having a depth of 200 feet or less, and those greater than 200 feet are treated as deep wells thus including all artesian wells.

Questionnaires were sent to 552 farmers and land owners of Ziebach county, 391 of whom responded with information on 412 wells and 5 springs. This represented a 70.8 per cent coverage for Ziebach county.

DEPTH AND DISTRIBUTION

Rural water supplies of Ziebach county are obtained from shallow pumped, deep pumped, and deep flowing wells, with no shallow flowing wells being reported. In general, wells are widely distributed and were reported from most all parts of the county.

Shallow wells: Approximately 97 per cent of all wells reported from the county were shallow pumped wells. Of the 400 shallow wells reported 44.5 per cent were between 0 to 50 feet in depth; 19.8 per cent from 50 to 100 feet; 21 per cent from 100 to 150 feet; and 14.7 per cent were from 150 to 200 feet in depth. Thus, over three fifths (64.3 per cent) of all shallow wells reported were less than 100 feet in depth. Those wells from 0 to 100 feet were also 62.4 per cent of all wells reported in the county. The percentage of shallow wells decreases as depth increases, not only because of the increased cost of construction of deeper wells, but the lack of deeper sources. Where ever possible shallow wells are used. The shallow well map on page 9 shows the depth of shallow wells which were reported in use.

In 18 townships of the county all shallow wells reported were 100 feet or less in depth and only eleven (15.5 per cent) of the 71 wells reported from these townships were greater than 50 feet in depth. A tabulation of these townships follows:

0 to 50 feet	
T. 7N.,	R.19E.
9	23
9	24
10	18
10	22
10	23

0 to 50 feet	
T.10N.,	R.24E.
11	19
11	24
15	18
15	20
16	17

0 to 100 feet	
T. 8N.,	R.21E.
11	23
12	23
12	24
13	17
15	19

Most of the townships in the county reported all wells to be shallow. The following tabulation lists these townships and the number of shallow wells reported from each:

Location		Total
Twp.	Rge.	Wells
7N.	19E.	1
8	21	1
9	20	2
9	21	1
9	23	1
9	24	3
10	18	4
10	19	1
10	20	5
10	21	5
10	22	2
10	23	6
10	24	5
11	18	10
11	20	9
11	21	11
11	22	13
11	23	11
11	24	12
12	18	12
12	19	12

Location		Total
Twp.	Rge.	Wells
12	20	13
12	22	7
12	24	9
13	17	2
13	18	17
13	19	16
14	18	10
14	20	6
14	21	8
15	18	2
15	19	2
15	20	3
16	17	1
16	18	7
16	19	3
16	20	6
16	21	18
17	17	2
17	18	9
17	21	15

Deep wells: Approximately 3 per cent (2.9 per cent) of the wells reported from the county were deep wells, both pumped and flowing. Of the 12 deep wells reported, two were deep flowing from depths of 1878 and 2385 feet (see table 3). The remaining were deep pumped wells of depths ranging between 210 and 370 feet (see table 2). The deep well map on page 11 outlines in red the area in which the flowing wells were reported and the map on page 12 shows the relation of the artesian areas of Ziebach county to the artesian areas of the state.

The location of the deep wells (pumped and flowing) together with minimum and maximum depths has been tabulated as follows:

Location Twp.	Rge.	Number of Wells	Depth Min.	Max.	Location Twp.	Rge.	Number of Wells	Depth Min.	Max.
8 N.	22E.	1 flowing	1875		13N.	21E.	2	210	275
9	19	1 flowing	2385		14	19	1	250	
11	19	1	367		15	21	1	370	
12	21	1	210		17	19	1	247	
12	23	1	250		17	20	1	300	
13	20	1	253						

No Wells were reported from the following townships:

Twp.	Rge.		Twp.	Rge.		Twp.	Rge.	
7N.	18E.	*	8N.	20E.		10N.	17E.	*
7	20	*	8	23	*	11	17	*
7	21	*	8	24	*	12	17	*
7	22	*	9	17	*	14	17	*
8	18		9	18		15	17	*
8	19		9	22				

* Denotes fractional townships.

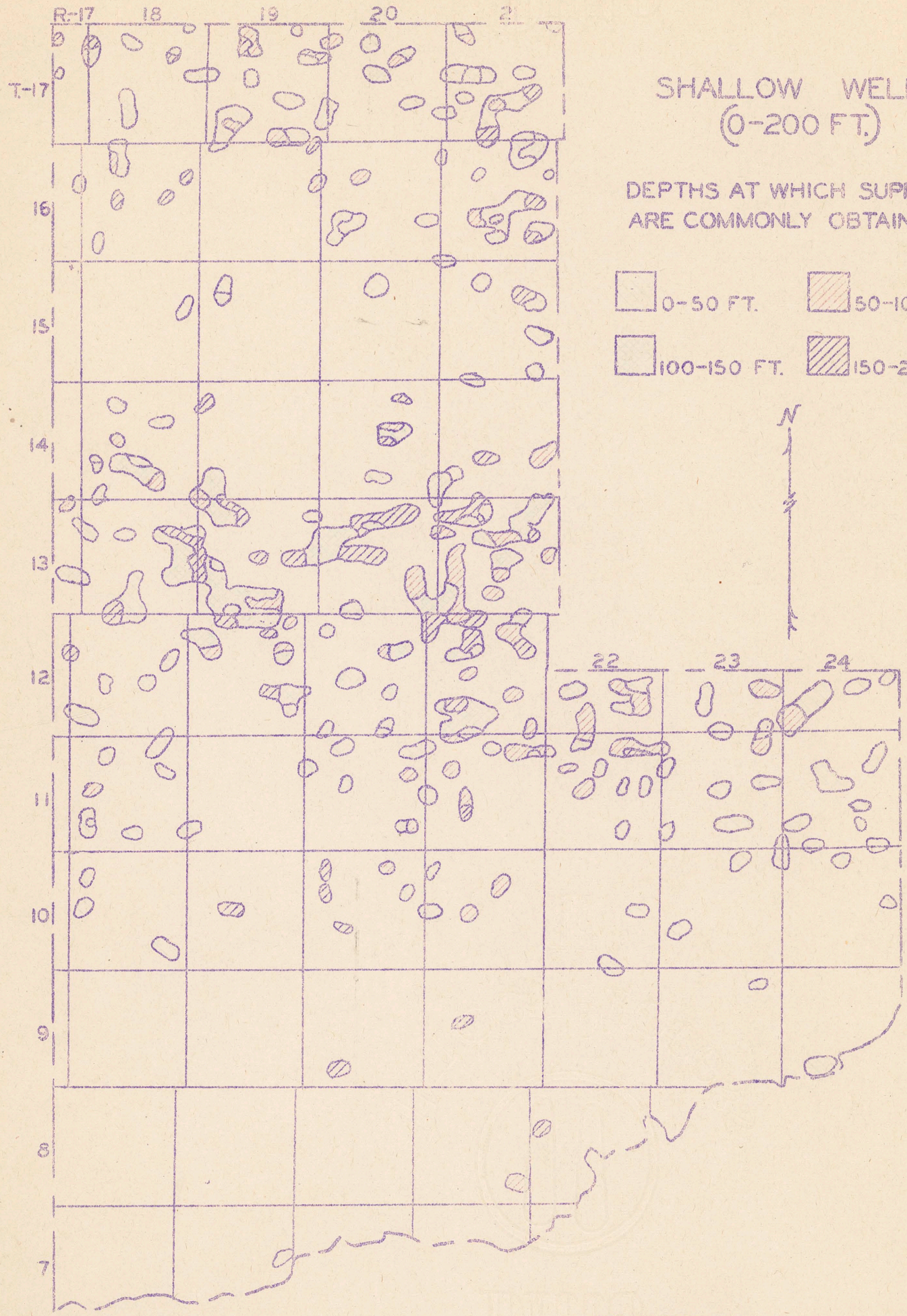
CHARACTER OF WELL WATER

In order to determine the character of water in the county, users were asked to indicate whether they considered supplies to be hard, moderately hard, or soft. Although chemical analyses of well water supplies are not generally available to farmers, usage of the water is a fairly good criterion of character until adequate laboratory analyses are available.

Of the shallow wells reported in the county, 27.7 per cent produced hard water, 26.8 per cent moderately hard, and 45.5 per cent soft water. Thus, 54.5 per cent of all shallow well water is hard or moderately hard water. Hard and moderately hard water wells are distributed over the county and predominate in all townships except the following from which soft water wells were listed. The number of soft water wells in these townships, in some cases, is notable. Township 12N., R.21E., reported 16; and T. 13N., R.20E., and 21E., reported 15 soft shallow wells each. These townships follow:

Location Twp.	Rge.	Number of Soft Water Wells	Location Twp.	Rge.	Number of Soft Water Wells
8N.	21E.	1	13N.	21E.	15
12	18	6	14	18	4
12	19	7	14	21	5
12	20	7	16	17	1
12	21	16	16	18	3
12	22	6	16	21	10
13	18	11	17	20	5
13	20	15	17	21	10

ZIEBACH COUNTY



SHALLOW WELLS (0-200 FT.)

DEPTHS AT WHICH SUPPLIES ARE COMMONLY OBTAINED

- 0-50 FT.
- 50-100 FT.
- 100-150 FT.
- 150-200 FT.

MILES
0 2 4 6

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The tendency toward soft water is most pronounced at depths ranging from 100 to 200 feet, although 29.1 per cent of the supplies from 0 to 50 feet were reported soft. At depths ranging from 50 to 100 feet, 43.4 per cent were reported soft; from 100 to 150 feet, 67.6 per cent were soft; and from 150 to 200 feet, 70 per cent were reported soft.

According to the reports of the deep pumped wells, 33.3 per cent produce hard water, 22.2 per cent moderately hard, and 44.5 per cent soft. Hard water was reported from the two deep flowing wells.

Of the 400 shallow wells reported, 87.3 per cent were suitable for drinking and water from 51 wells was unsuitable. Approximately 70 per cent of the unsuitable wells reported unsatisfactory were from 0 to 50 feet in depth. The number of wells producing unsuitable water decreases with depth.

All of the deep pumped wells produced water suitable for drinking, but the two flowing wells were reported unsuitable.

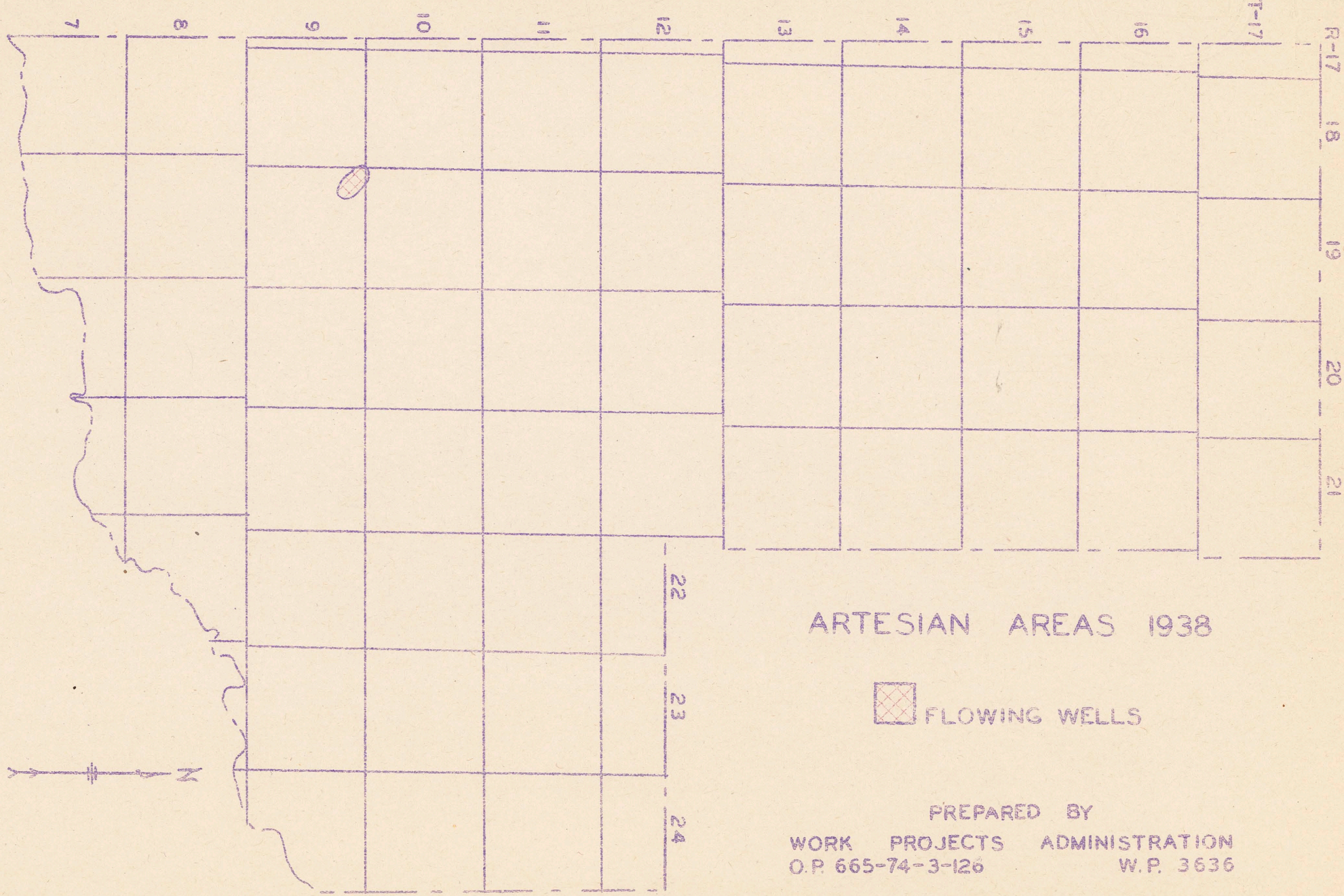
Thus, in general, well water in Ziebach county is suitable for drinking purposes and more unsuitable waters are obtained from shallow wells less than 100 feet in depth, than in deeper wells. Contamination from surfaces may be responsible in some cases for unsuitable waters but in most cases unpalatable or disagreeable chemical ingredients are present. Injurious substances may also be present in some cases but these can be determined only from chemical analyses.

ADEQUACY OF WELL WATERS

In response to questionnaires, users reported supplies, in general, adequate for present needs. Needs vary however, and dry cycles in this and surrounding areas, changes in land utilization, and modification of farm management affect both supply and demand for water.

Of the 412 wells for which adequacy was reported, 95 (23 per cent) were reported inadequate. Among the shallow wells 92 were reported inadequate.

ZIEBACH COUNTY



ARTESIAN AREAS 1938

FLOWING WELLS

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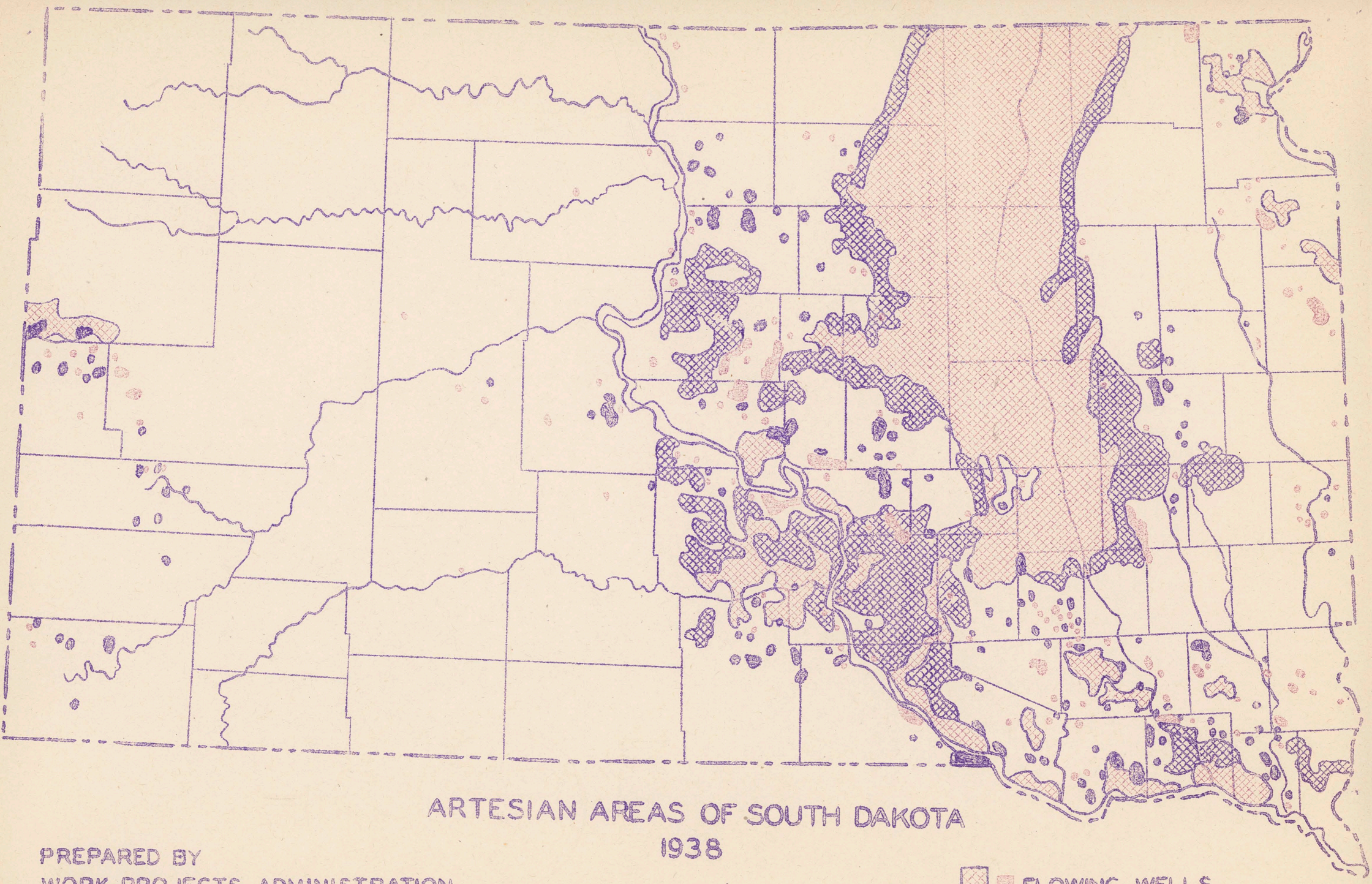

ARTESIAN AREAS OF SOUTH DAKOTA
1938

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FLOWING WELLS

PUMPED ARTESIAN WELLS

Inadequacy of shallow wells at various depth ranges was: 0 to 50 feet, 24.7 per cent; 50 to 100 feet, 27.8 per cent; 100 to 150 feet, 15.5 per cent; and 150 to 200 feet, 22 per cent. Three (30 per cent) of the deep pumped wells were reported inadequate, and all of these were located in townships which reported a large percentage of inadequate shallow wells. (See table 2.) From two flowing wells an adequate supply was reported. Both were controlled by valves and a steady rate of flow was reported. The volume of flow of the flowing well in T.8N., R.22E., was reported to be 50 gallons per minute, and the well in T.9N., R.19E., 500 gallons per minute.

Inadequate wells were not localized in the county, but in the following townships reported, all shallow wells were reported adequate:

Location		Number Shallow	Location		Number Shallow
Twp.	Rge.	Wells	Twp.	Rge.	Wells
7N.	19E.	1	14N.	21E.	8
9	23	1	16	18	7
9	24	3	16	19	3
10	19	1	16	20	6
10	20	5	17	17	2
13	17	2	17	18	9
14	19	2	17	20	9

IRRIGATION

Forty five shallow wells irrigated small tracts used for gardens in sizes varying from 1/8 acre to 5 acres, a total of 13 1/8 acres. Two deep pumped wells used for irrigation of garden plots totaling 5/8 of an acre. No springs were used for irrigation.

SUPPLEMENTARY SUPPLIES

Springs are not an important source of supplementary supplies in Ziebach county since only 5 were reported. All of these were reported from the northern part of the county. One, in T.17N., R.19E. watered several hundred head of livestock each day. From all of the springs adequate supplies were reported and the water was said to be suitable for drinking. The character of only one spring was reported and this was described as soft. The springs reported were

in the following townships:

T.16N.,	R.18E.	- 1 spring	T.17N.,	R.19E.	- 2 springs
16	20	- 1 spring	17	20	- 1 spring

Cisterns are a fairly important source of supplementary supplies in Ziebach county. A total of 32 cisterns, or approximately one cistern to every 13 wells was reported. Of these the greater number was used for laundry and other soft water needs in hard-water areas. Cisterns also supplied water for cooking and drinking in areas where well water supplies were unsuitable or unavailable. Users of water from shallow pumped wells reported 31 cisterns, 20 of which were used for drinking and cooking and 23 for laundry purposes. Only one cistern was reported from those with deep wells. Users of spring water reported no cisterns.

ZIEBACH COUNTY

Table 1.

DATA ON PUMPED WELLS FROM 0 TO 200 FEET (INCL.) IN DEPTH

LOCATION		Number of Wells	DEPTH OF WELLS			CHARACTER OF WATER					ADEQUACY OF SUPPLY			
Twp.	Rge.		Min.	Max.	Ave.	Hard	Med.	Soft	Corrode Casing	Unsuitable for Drinking	Adequate	Inade-quate	Number used for Irrigation	Approximate Acres Irrigated
7	19	1	-	-	25	1	-	-	1	1	1	-	-	-
8	21	1	-	-	93	-	-	1	-	-	-	1	-	-
8	22	1	-	-	150	-	-	-	-	-	-	1	-	-
9	20	2	-	-	150	-	-	-	-	-	-	2	-	-
9	21	1	-	-	150	-	-	-	-	-	-	1	-	-
9	23	1	-	-	10	-	1	-	-	-	1	-	-	-
9	24	3	15	20	27	3	-	-	2	3	3	-	1	1/8
10	18	4	20	32	26	3	-	1	-	3	3	1	-	-
10	19	1	-	-	150	1	-	-	-	-	1	-	-	-
10	20	5	90	157	129	4	-	1	-	-	5	-	-	-
10	21	5	16	146	75	-	3	2	-	-	4	1	-	-
10	22	2	10	15	12	2	-	-	1	1	1	1	-	-
10	23	6	14	37	24	6	-	-	-	3	3	3	-	-
10	24	5	6	20	13	4	1	-	-	2	3	2	-	-
11	18	10	14	102	44	7	1	2	3	4	9	1	1	-
11	19	1	-	-	16	1	-	-	-	1	-	1	-	-
11	20	9	18	124	57	1	4	3	2	-	8	1	-	-
11	21	11	16	200	82	4	3	2	2	2	6	5	-	-
11	22	13	12	171	67	3	6	4	1	-	11	2	2	1/8
11	23	11	7	76	38	8	1	1	2	4	5	6	1	1/8
11	24	12	16	50	32	9	1	-	1	6	5	7	-	-
12	18	12	14	165	131	1	3	6	-	2	6	6	-	-
12	19	12	12	185	112	-	3	7	-	1	11	1	1	1/8
12	20	13	7	140	92	2	2	7	1	-	12	1	2	1/2
12	21	21	11	200	121	2	2	16	2	2	16	5	3	7/8
12	22	7	30	150	78	1	-	6	-	-	5	2	2	1/4
12	23	5	32	60	49	4	1	-	-	-	3	2	1	1/8
12	24	9	18	93	48	3	4	2	-	2	4	5	-	-
13	17	2	85	100	93	-	1	-	-	-	2	-	-	-

Continued on next page.

ZIEBACH COUNTY

Table 1.

(Cont'd.) DATA ON PUMPED WELLS FROM 0 TO 200 FEET (INCL.) IN DEPTH

LOCATION		Number of Wells	DEPTH OF WELLS			CHARACTER OF WATER					ADEQUACY OF SUPPLY			
Twp.	Rge.		Min.	Max.	Ave.	Hard	Med.	Soft	Corrode Casing	Unsuitable for Drinking	Adequate	Inade-quate	Number used for Irrigation	Approximate Acres Irrigated
13	18	17	15	200	80	1	4	11	-	2	14	3	3	1
13	19	16	18	194	106	3	6	5	-	2	14	2	2	1/8
13	20	18	14	200	125	1	-	15	1	1	15	3	2	5/8
13	21	25	39	183	102	3	5	15	1	2	21	4	11	2 1/4
14	18	10	20	135	63	2	2	4	-	-	8	2	1	5
14	19	2	128	200	164	1	1	-	-	-	2	-	-	-
14	20	6	12	162	108	2	2	2	-	-	5	1	1	1/8
14	21	8	12	190	70	1	1	5	-	-	8	-	3	3/8
15	18	2	34	36	35	-	1	-	-	1	1	1	-	-
15	19	2	10	100	55	-	2	-	-	-	1	1	-	-
15	20	3	16	30	18	-	2	1	-	1	1	2	-	-
15	21	0	14	150	44	1	5	3	-	-	6	4	-	-
16	17	1	-	-	16	-	-	1	-	-	-	1	-	-
16	18	7	5	175	87	1	1	3	1	-	7	-	1	-
16	19	3	80	150	121	-	2	-	-	-	3	-	-	-
16	20	6	6	144	67	3	2	-	2	2	6	-	-	-
16	21	18	10	180	73	4	2	10	2	1	14	4	1	1/4
17	17	2	42	160	101	-	1	-	-	-	2	-	-	-
17	18	9	8	175	111	2	3	4	-	-	9	-	3	-
17	19	25	14	164	60	2	11	8	3	2	23	2	2	5/8
17	20	9	42	147	79	1	3	5	-	-	9	-	-	-
17	21	15	18	200	82	1	3	10	1	-	11	4	1	1/2
Total		400				99	96	163	29	51	308	92	45	13 1/8

ZIEBACH COUNTY

Table 2.

DATA ON PUMPED WELLS OVER 200 FEET IN DEPTH

LOCATION		Number of Wells	DEPTH OF WELLS			CHARACTER OF WATER					ADEQUACY OF SUPPLY			
Twp.	Rge.		Min.	Max.	Ave.	Hard	Med.	Soft	Corroded Casing	Unsuitable for Drinking	Adequate	Inade-quate	Number used for Irrigation	Approximate Acres Irrigated
11	19	1	-	-	367	1	-	-	-	-	-	1	-	-
12	21	1	-	-	210	-	-	1	-	-	1	-	-	-
12	23	1	-	-	250	-	1	-	-	-	-	1	-	-
13	20	1	-	-	253	-	-	1	-	-	1	-	-	-
13	21	2	210	275	243	1	-	1	1	-	2	-	2	5/8
14	19	1	-	-	250	1	-	-	-	-	1	-	-	-
15	21	1	-	-	370	-	-	-	-	-	-	1	-	-
17	19	1	-	-	247	-	-	1	-	-	1	-	-	-
17	20	1	-	-	300	-	1	-	-	-	1	-	-	-
Total		10				3	2	4	1	-	7	3	2	5/8

NOTE: No Pumped Wells over 200 feet in depth reported from the following townships and ranges: T.7N., R. 19E; T.8N., R. 21, 22E; T.9N., R. 20, 21, 22, 23, 24E; T.10N., R. 18, 19, 20, 21, 22, 23, 24E; T.11N., R. 18, 19, 20, 21, 22, 23, 24E; T.12N., R. 18, 19, 20, 22. 23, 24E; T.13N. R. 17, 18, 19E; T.14N., R. 18, 20, 21E; T.15N., R. 18, 19, 20E; T. 6N., R. 17, 18, 19, 20, 21E; T.17N., R. 17, 18, 21E.

Table 3.

DATA ON FLOWING WELLS

LOCATION		Number	DEPTH OF WELLS			CHARACTER OF WATER					ADEQUACY OF SUPPLY					
Twp.	Rge.	Wells	Min.	Max.	Ave.	Hard	Med.	Soft	Corroded Casing	Unsuitable for Drinking	Adequate	Inade-quate	Number used for Irrigation	Approx. Acres Irrigated	Ave. Gallon Per Min.	Number Con-trolled
8	22	1	-	-	1878	1	-	-	1	1	1	-	-	-	50	1
9	19	1	-	-	2385	1	-	-	1	1	1	-	-	-	500	1
Total		2				2	-	-	2	2	2	-	-	-	-	2

NOTE: No other flowing wells were reported from Ziebach county

ZIEBACH WELL NOTES

The following are pertinent remarks quoted from questionnaires returned by farmers and are included opinions of the water situation are expressed by the individual farmers and must be so applied.

T.11N.,R.21E. Sec. 5
80 ft:
"I have tried to drill a shallow well in a valley for drinking purposes but have gone down 20 ft. and drilled the last 12 ft. in blue shale or pierre shale and had to give it up as a bad job as I drilled with a post auger."

T.11N.,R.23E. Sec. 4
48 ft:
"The well in use at present has sufficient water for our use, but I have not many head of stock. I have never pumped it dry, though recently I pumped six hours with an engine as fast as a 1½ inch pipe would carry it. Have another well but is not very deep due to rock and did not furnish enough water for stock. This well can still be used but is not needed."

T.11N.,R.24E. Sec. 14
50 ft:
"We have tried to dig several wells on my land but they have all turned out to be dry holes. The well I have now won't supply enough water for stock for a steady supply."

T.12N.,R.23E. Sec. 19
250 ft:
"This well was drilled with a 4½ inch bit. When they got down 35 ft. they struck a big rock, then they used a 3 inch bit, so couldn't put casing down any farther than rock. We had soft water and plenty of it for about 8 years, then the water began to get hard and less, until now it hardly gives enough for our use."

T.13N.,R.20E. Sec. 17
179 ft:
"Had a well dug in the early spring of 1926 that had plenty of water for 35 head of stock. It kept going down until 1929 when it gave barely enough for house use. This well was 165 ft. deep. Had another well dug in 1929. They struck a small vein at 80 ft. then hit another at 175 ft. The water came within 40 ft. of the top with indications of plenty of water for 40 head of stock. It started decreasing in 1933 and have been getting less each year until we are only able to get enough for house use and about three head of stock. The water is soft and good."

T.15N.,R.18E. Sec. 13
36 ft:
"Struck blue shale between 30 and 35 ft. We have two stock wells. The one on the other side of creek waters about 25 head of cattle. Water runs in very slow, if pumped dry one day will water 1/3 less stock the next."

T.14N.,R.19E. Sec. 8
160 ft:
"The two wells are about 130 ft. apart. One is used for stock only, plenty of water for 250 head of livestock. The other well has plenty water but gets rusty & red, satisfactory for drinking."

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